



MAGMA

Michigan Academy for Green Mobility Alliance

Driving Engineering Curriculum to Meet Industry Demand

October 26, 2012



MAGMA

Michigan Academy for Green Mobility Alliance

Matt Shields

Energy Market Talent Manager
Workforce Development Agency





Transforming Michigan's Automotive Industry





Galvanizing Issue

- Growth in the green mobility industry sector
- Increased need for trained workers
- Engineer and technician skill gap





MAGMA Mission & Objectives

Mission: Provide rapid skill growth in green technology solutions for advanced mobility to meet industry needs

Objectives:

- Prepare individuals for emerging technologies in vehicle and vehicle component design, manufacturing, and maintenance
- Rapid/accelerated training and re-training targeted toward:
 - Displaced and incumbent engineers
 - Engineering students
 - Displaced and incumbent technicians
 - Technician program students



Multiple Partners & Stakeholders



Michigan Tech



DELPHI



DENSO





Key Components of MAGMA

1. Focus on employer-defined needs in green mobility
 - Industry generates list of critical skills for high demand jobs
2. Provide a menu of training opportunities to meet those needs
 - Workforce Development Agency coordinates education program Requests for Proposals
3. Leading to certificates and degrees
 - Educational partners respond to RFPs with courses and certificate programs designed to develop these critical skills



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Michigan Academy for Green Mobility Alliance

Greg Moss

DENSO International America

MAGMA Governing Board Co-Chair

DENSO





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- What are **industry's needs**?
- What are the **emerging technologies**?
- What is the **labor pool**?



What are industry's needs?

- Early projections
- Current reality

Fuel Economy and
Emissions Standards



Fuel Prices and
Infrastructure



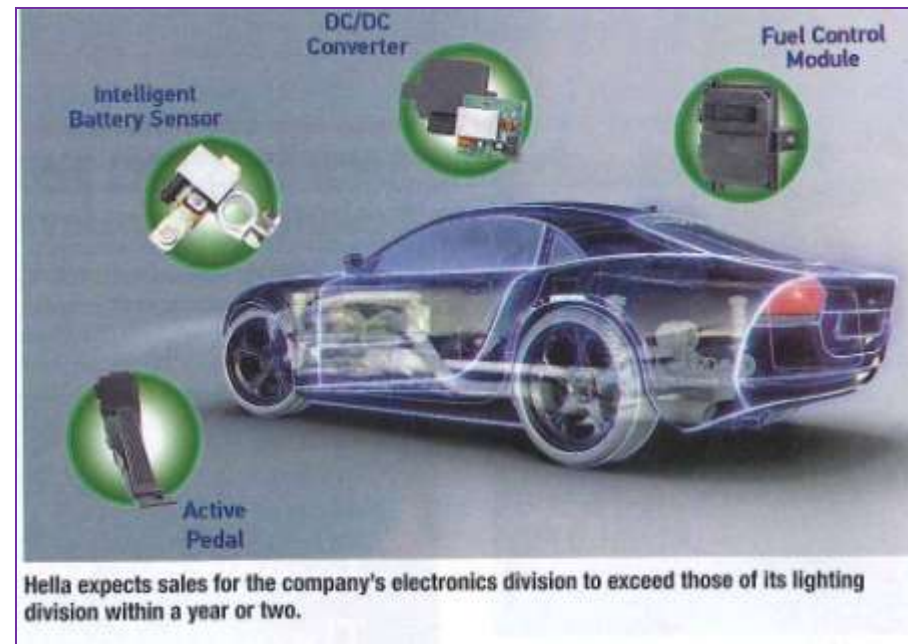
Grid Capacity





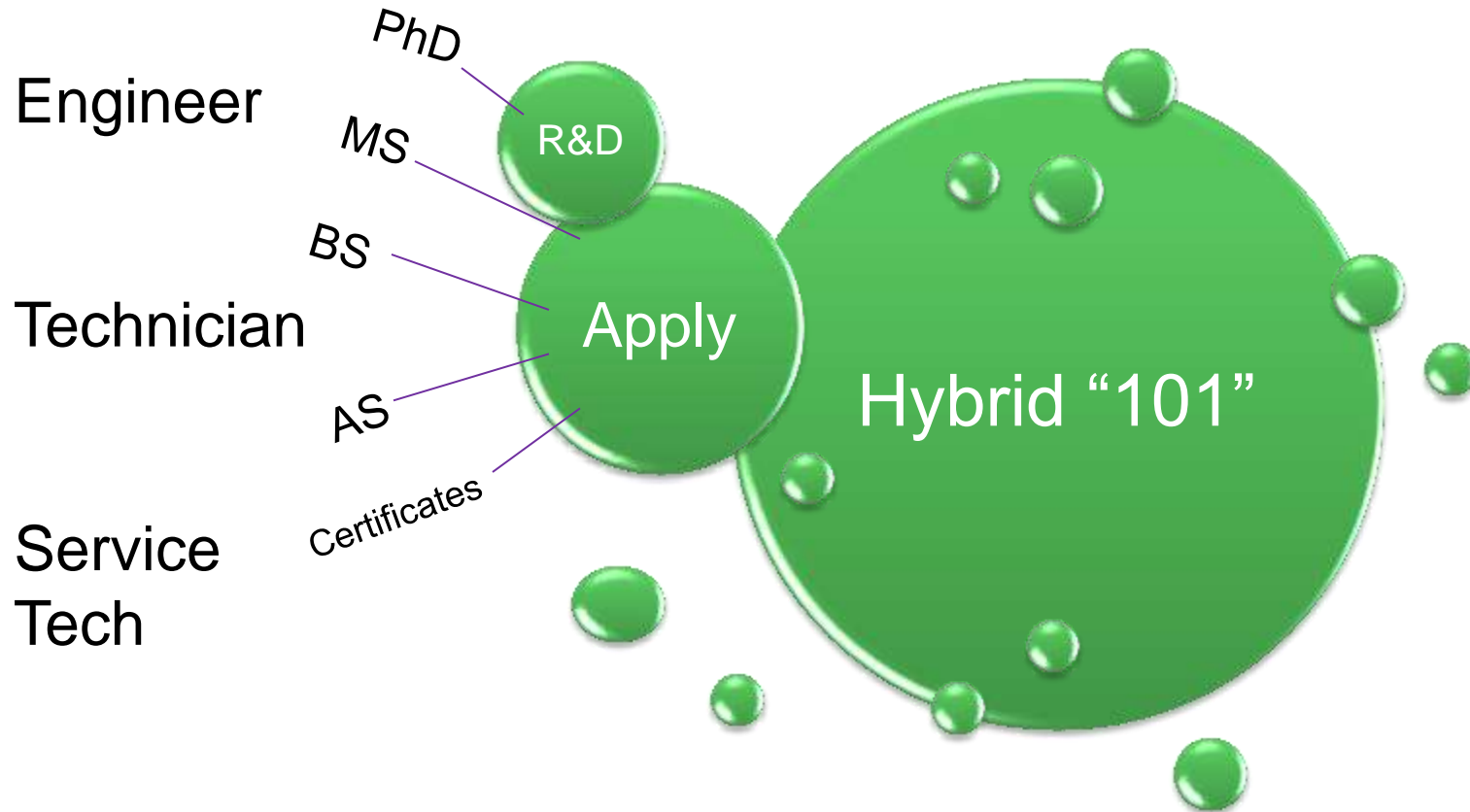
What are the emerging technologies?

- Multiple levels of “hybrid” vehicles
- Interconnected systems within vehicles
- V2V and V2I – Interconnected vehicles
 - Vehicle to vehicle, Vehicle to infrastructure





What is the labor pool?



Short-term "Patch" / Long-term "Pool"



The Stories

- Class 1 – The new vocabulary: “Hybrid”
- Focus – Specialty projects
- Add-on Skills – Not the same old ME
- The Pain – *Systems* skills



Dr. Carl Anderson

Professor,
Mechanical Engineering and
Engineering Mechanics

Associate Dean for Research and
Graduate Studies

MichiganTech



Michigan Tech



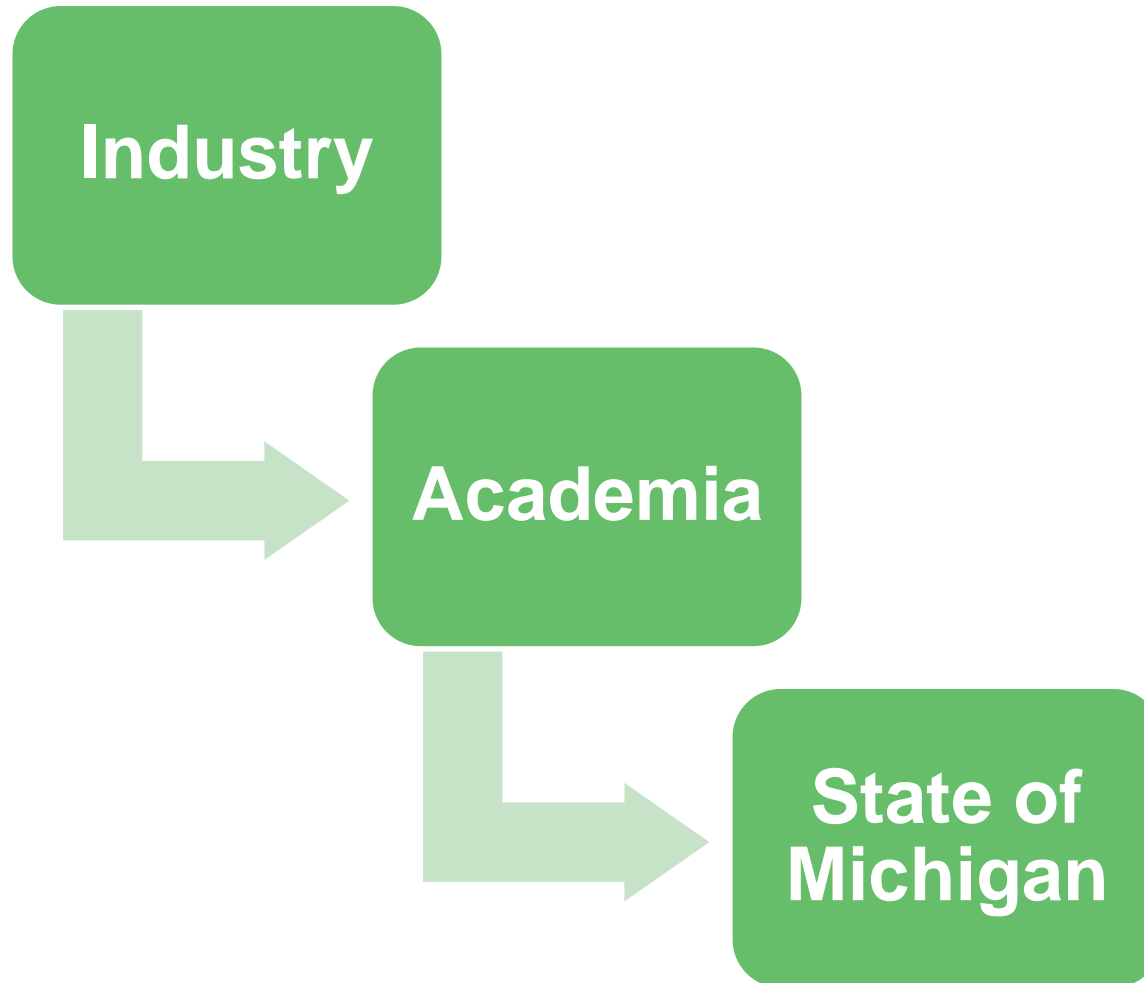


Houghton, MI





MAGMA – A Trilateral Partnership





First time in 30 years ... **why so long?**

It is not easy to
tell faculty
what they should
be doing.





Why did it work this time?

- **Late Fall 2008 - A Call from Industry**
 - “We can do *something*.” T. Woychowski, GM
 - HEV Powertrain course via distance learning
 - Spring semester enrollment: 93 grad students
- **Spring 2009 ...**
 - DOE announced a program in Transportation Electrification
 - MAGMA had formed.



Why did it work this time?

- MAGMA provided comprehensive industry input to define skill requirements
- MAGMA helped direct tuition scholarships to displaced and working engineers
- DOE provided education grants to develop new curricula in HEV engineering



MTU Modified Existing Courses

- Intro. to Motor Drives
- Power Electronics
- Power Electronics Lab
- Power System Operations
- Power System Protection
- Power System Protection Lab
- Distribution Engineering
- Internal Combustion Engines I
- Internal Combustion Engines II





MTU Created Eight New Courses

- Advanced Electric Machines
- Vehicle Battery Cells & Sys
- Vehicle Dynamics
- Embedded Control Systems
- **Intro. To Propulsion Systems for HEVs**
- **Adv. Prop. Systems for HEVs**
- **Intro. To Prop. Systems for HEV Laboratory**
- **Adv. Prop. Systems for HEV Laboratory**





Michigan Tech Mobile Laboratory



Courses for credit, Short courses, Outreach, Public Education

The Vehicle Development Process Using State-of-the-Art Tools



Vehicle Modeling (Simulink)



Systems Validation (cRIO)



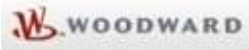
Powertrain Subsystems (VeriStand & INERTIA)



Production Vehicle Testing (ADCS)



Embedded Controls (MotoHawk)



Powertrain HIL Testing (VeriStand & DynaCar)



Advanced Modeling (Cruise & DynaCar)

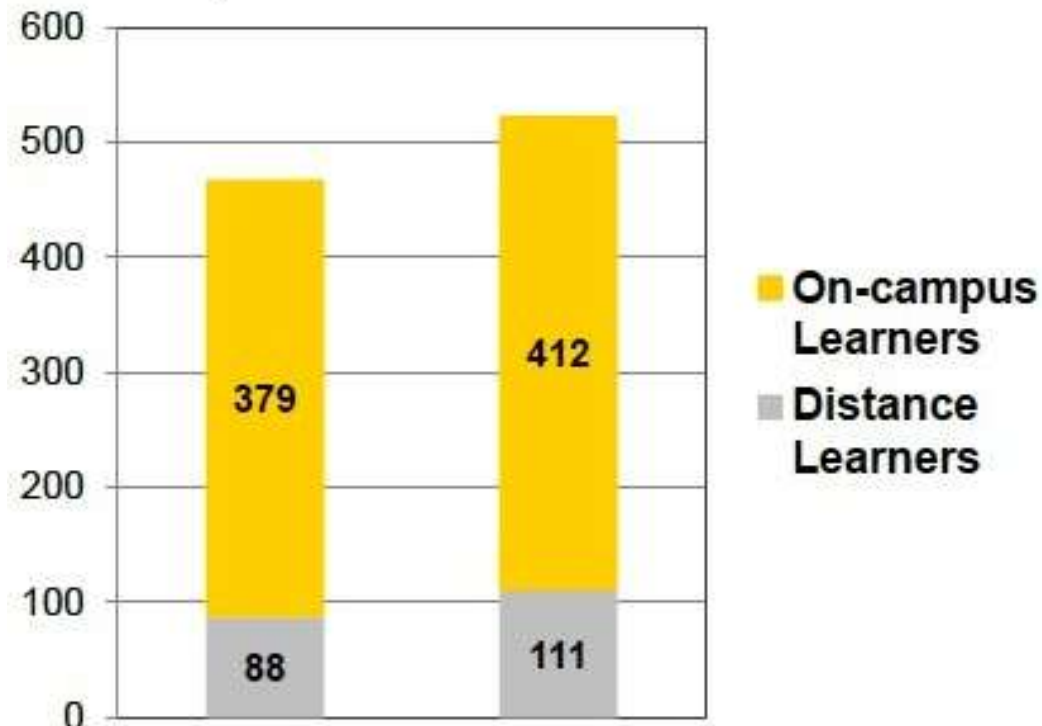




How Well Has It Worked?

- Interdisciplinary – 4 departments
- Students integrate classes into their degrees
- Class enrollments strong & growing

**Enrollment in New & Modified Courses
Academic Years 2010-11 and 2011-12**





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MAGMA Success

- Creating curriculum to meet new industry needs
 - Including technician training that is being pushed out nationally
- Leveraging Resources
 - Over \$4.3 million
 - 7 funding streams
- Over 800 Individuals Trained
- State & National Model



Success Stories

“This is a much **more efficient model** than we’ve used in the past,” says Sean Newell, dean of Ford Motor Co.’s College of Engineering and chairman of the alliance’s governance board. “By joining forces, we are **able to meet workforce needs faster and more effectively** than individual employers could do on their own.”

– quote from July 2011 edition of *Workforce Management*

How can others implement this type of collaboration?



- Identify a neutral partner to facilitate the interactions between partners
- Identify parameters for the collaboration
- Be open and specific about skill needs
- Be hands-on in curriculum development
- Be flexible – step outside traditional education models
- Identify the value proposition



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Contact Information

Matt Shields
(517) 335-0840
shieldsm1@michigan.gov

Greg Moss
(248) 372-8275
gregory_moss@denso-diam.com

Dr. Carl Anderson
(906) 487-2378
cander@mtu.edu

